BASIC PRINCIPLES

of

RISK MANAGEMENT and DECISION ANALYSIS

Notes for Employees of the Ministry of Agriculture Food & Rural Affairs

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1) Introduction

The Ontario Government recognizes risk management and decision analysis as important tools that help ensure the effectiveness and efficiency of publicly funded programs. Three recent illustrations of this include: 1) the Secretary of Cabinet's Quality Management Framework, that includes risk management as a cornerstone of the initiative, 2) the Office of the Controller's Risk Management Framework initiative, and 3) the multi-ministry, Inspection, Investigation and Enforcement (II&E) Risk Management Framework. All three examples also include aspects of decision analysis.

The Ontario Ministry of Agriculture Food and Rural Affairs (OMAFRA) recognizes the importance of these tools. Risk management is officially identified as one of the Ministry's four core businesses. Historically in OMAFRA, the term risk management has been used to describe programs that help to control financial risks to primary producers. Nevertheless since 1995, the Ministry has promoted the use of risk and decision analysis for its food safety, animal health and plant health programs. The recently approved Ontario Food Safety Strategy is based on the principles of risk management. The Ministry also continues to be committed to farm relief programs and to provide guidance to farmers on how to manage business risks (see OMAFRA Publication 810 "Managing Risk In Agriculture" Queen's Printer for Ontario, 2000).

The objective of this document is to describe basic principles of risk management and decision analysis. This will help employees, at all levels, to apply these tools on a daily basis. The terminology used is aligned with that which is recommended by the Ontario Public Service (OPS) II&E Risk Management Framework, as well as being aligned with the principles outlined by the Office of the Controller's Risk Management Framework. An OMAFRA version of that framework (entitled "Managing Risk Through Assessment and Control: A Framework for the Ministry of Agriculture Food and Rural Affairs"), serves as a more detailed, companion document to this document.

This document describes practices that employees may add to their "tool box" when making resource management decisions. Many employees already apply these principles to varying degrees, either consciously or subconsciously, because of formal training, work experience or by intuition. Future decisions may or may not differ greatly from those made previously, but at the very least, the conscious application of these principles will improve the rigor and comfort level of decisions.

2) Managing Risks in Ontario - A Public Good

Risks to Quality-of-Life:

Risk is a function of both the probability of something undesirable happening and the magnitude of the impact of that hazard. Risk cannot be assessed by considering probability alone. One cannot choose between a probability of 1 in 10 vs. 1 in 500, until one knows the magnitude of the negative impact associated with each probability. For example, a person might readily accept a risk with a 1 in 10 probability of losing $5, over a risk with only a 1 in 500 probability of losing their house. Risk also involves an element of uncertainty. We are often uncertain as to the actual probability and impact components of risk (1 in 10 or 1 in 15 ? $5 or $ 10 ?).

Everyone faces some level of risk on a daily basis. This includes risks of injury, illness, financial stress, or general decrease in quality-of-life to themselves, their loved-ones, colleagues, employees or their environment. All of these risks have certain probabilities of occurring, and certain direct or indirect negative impacts on our quality-of-life. Many aspects of these risks are uncertain.

There is no such thing as “zero risk”, but one can control risks to tolerable levels by reducing either the probability or impact components of risk, or both. For example, storing matches beyond the reach of children helps reduce the probability of a fire being started. Use of smoke detectors helps reduce the probability of a fire having a severe impact. Fire insurance helps reduce the financial impact of a fire. Similarly, driving defensively in a well-maintained vehicle reduces the probability of being involved in a serious road accident. Wearing seat belts, and maintaining an effective emergency / ambulance / paramedic / hospital system, reduces the probability of a fatality, if an accident occurs. Insurance reduces the financial impact of income lost due to injury in a traffic accident.

Individuals who are more averse to risk may be willing to pay more or behave in a manner so as to reduce the probability of negative events occurring, and/or their impact on their quality-of-life. Attitude toward risk differs between people and may change over time within and between people. Compare attitudes of a single 20 year-old college student to a 32 year-old mother of three young children, to a widowed senior citizen living on a fixed income.

OMAFRA Employees Help Reduce Risks to Ontario Citizens:

Reduction of risks, both in terms of reducing the probability or the impact of negative events on the quality-of-life of citizens, can be viewed as a primary objective of many programs in the Ministry. These programs have at their heart the intent to serve the ‘public-good’. Many OMAFRA employees contribute directly or indirectly to the reduction of risks to the quality-of-life of Ontario citizens and to the prudent allocation of public resources to manage those risks.

To achieve this, Ministry employees must understand and apply the principles of risk management and decision analysis.

Levels of Organization:

The principles described in this document may be applied at various levels of organization within the Ministry. For example, a local supervisor may assess the risks to successful implementation of an established program in her area. She may use the tools of decision analysis on a day-to-day basis to decide how to allocate the resources, within her control, to manage the risks to local program implementation. At a higher level of organization, the program manger at Ministry Head Quarters may use the tools to make decisions concerning the allocation of program resources to different local area managers. At a still higher level of organization, senior management may use the tools to decide what Ministry programs should be designed to do. This may lead to new or revised legislation and regulations, new Cabinet and Management Board submissions, and even inter-ministry reorganization of programs and responsibilities, to better protect the quality-of-life of Ontario citizens.

3) Managing Risks Through Continuous Risk Assessment & Risk Control

A Note About Terminology:

The terminology used in the discipline of risk continues to evolve internationally. Various agencies and organisations use different terms to refer to the same process and, in some cases, the same terms refer to different processes.

The terminology used in this document is aligned with that used in the OPS II&E Risk Management Framework. This terminology was derived from several sources including: the Risk Management Framework from the Provincial Office of the Controller; the Canadian Standards on Risk Analysis and Risk Management; the Australia and New Zealand Risk Management Standard; the UK Health and Safety Executive; and the US Environmental Protection Agency.

A notable example of slightly different terminology is that supported by the World Trade Organisation, Food and Agriculture Organization of the United Nations, the World Health Organization and Codex Alimentarius, in issues of health, food and agricultural trade.

These latter organizations refer to “risk analysis” as the umbrella term that includes risk assessment, risk management and risk communication as its components. Whereas the previous organizations use “risk management” as the umbrella term, which includes elements of risk assessment, risk analysis, risk control and stakeholder participation.

In 1995 (in the absence of an OPS Risk Management Framework at that time), OMAFRA adopted the risk terminology supported by the World Trade Organisation, Codex and Agriculture and Agri-Food Canada. OMAFRA is now switching (in 2001), to the terminology used in the OPS II&E Risk Management Framework so that the Ministry may be aligned with terminology recently adopted by OPS central agencies.

This will present somewhat of a challenge to Ministry employees who interact with inter-provincial, federal and international agri-food trade organisations, that use the other terminology. Such employees must be able to “translate” between the two risk “languages”. The glossary in Appendix A provides cross references for the two systems.

Regardless of the specific words used, both systems contain very similar components and concepts. The overall processes achieve the same end.

Risk Management:

The overall objective is to manage risks as effectively and efficiently as we can. This will involve trade-offs between risks, benefits and costs. In order to manage risks associated with specific hazards, we must identify hazards and assess the risks by analyzing the probability, impact and uncertainty components of the various risk scenarios. We must then identify options for controlling and reducing the risks to acceptable levels, and then choose and implement control measures that are effective and efficient. Finally, we must monitor the system to ensure it remains under control and we must acquire new data, re-assess and modify controls as appropriate. This entire process is known as risk management (using the terminology adopted by the OPS). Deciding among methods of data acquisition and control strategies, requires the application of decision analysis (Section 4).

The steps required for risk management are listed in Figure 3.1, and are summarized in a schematic flow diagram in Figure 3.2 on pages 8 and 9 respectively.

The Risk Assessment Component of Risk Management:

Everyone assesses risks on a daily basis. For example, on the morning after a local ice storm we may consider the probability of becoming involved in a traffic accident on the way to work, and the potential seriousness of such an accident. We might weigh that risk against the risk of not attending the meeting scheduled for that morning. We might ask ourselves: What is the probability of my missing important information by not attending that meeting, and how much harm might be caused to myself and others? How does that risk compare in probability and impact, to the risk of becoming involved in a traffic accident? How might I minimise the probability and/or impacts of each risk? How certain am I of the information I am using in this informal risk assessment? What information can I obtain to reduce the uncertainty of the data used in my assessments?

The task of risk assessment within the Ministry should <u>not</u> be limited to a few specialists. The power of risk assessment will increase if many employees use it on a daily basis. In some situations it may be appropriate to conduct and formally document very detailed risk assessments, that require input from several technical experts, perhaps to support a decision at Cabinet. However in many situations, it may be more appropriate for less technical staff to apply the basic principles to conduct and briefly document less formal assessments. The "tool" of risk assessment does not provide a "magic" solution to problems. It can however, document and clarify the components of risk, leading to a more efficient and effective utilisation of resources, and better decisions.

Quantitative and Semi-Quantitative Risk Assessment:

Techniques and computer software exist to develop and run quantitative mathematical models of risk in systems. A description of such methods is beyond the purpose of this document. A moderate understanding and experience in mathematics, statistics, probability distributions and

computer simulation modelling is required to take full advantage of these tools. An excellent textbook on this subject is available from John Wiley & Sons Publishers 2000, by David Vose, entitled "Risk Analysis: A Quantitative Guide". One example of software is from Palisade Corporation (www.palisade.com), who produces a suite of software products including "@Risk™" which work in conjunction with MicroSoft Excel™ spread sheets to facilitate MonteCarlo simulation modelling of quantitative risk assessment models.

Alternatively, semi-quantitative assessments may be conducted where participants agree to a relative scoring system for different steps of the assessment. This can allow a reasonably systematic comparison of relative risks across systems. But it is not necessarily an easy process. It can degenerate into disagreement of how one can compare "apples to oranges". It does however provide focus and structure. It helps to identify information gaps and contributes to a better understanding of the risks. For a more detailed description of methods of assessing and graphically summarizing risk see the descriptions and food safety example presented in the companion document "Managing Risk Through Assessment & Control: A Framework for the Ministry of Agriculture Food and Rural Affairs".

Even if many staff are not directly involved in the development of stochastic mathematical models of risk , they can benefit from having a basic understanding of the principles of risk assessment. This will allow them to provide higher quality information that is to be used in such models, and they will be better at interpreting, communicating and applying the outcomes from such models.

Regardless of the level of detail appropriate for a given assessment or series of parallel comparative assessments, the basic components of hazard, probability, impact and uncertainty should be clearly evident in all assessments.

Risk Control:

There is a need for transparency of general policies that describe publicly funded approaches to the control of risk. Policies concerning the control of specific risks should subsequently be described and be in alignment with the general policies.

Some general program policies might include descriptions of: the values potentially at risk that the Ministry is protecting on behalf of the public; safety standards used for different types of risks; how uncertainty is to be handled and the general circumstances in which managers accept err on the side of risk vs. err on the side of safety; who has the burden of proof (ie. the risk-producer- beneficiaries or the risk bearer); communications guidelines describing when it is appropriate to go to full stakeholder negotiations and when not.

Some types of information that should be included in a detailed profile of a specific risk might include: the value(s) placed at risk in the particular situation; the extent to which the hazard impacts on those values; the general perception of the nature and magnitude of the risk; who produces and who benefits from the risk; who bears the risk; the degree to which the risk bearer understands and

voluntarily accepts the risk; the characteristics of the risk that influence where and how the risk should be controlled most effectively and the likelihood of successful risk control; the expected benefits and positive values associated with taking the proposed risk; practical cost effective options for risk reduction, prevention and control.

Ultimately, decisions must be made. Depending on the situation, this may involve formal, documented, decision analysis that considers costs, probabilities and benefits among appropriate stakeholders (Section 4). Documentation is also required to describe: a) the risk control plan that will reduce the risk to an acceptable level, b) an audit process to ensure that the desired standards are being achieved, c) who is responsible for controlling the risk, and d) who pays for the risk control and how. Once a plan is implemented, it should be monitored and re-evaluated to ensure that it achieves the desired effect. Corrective action should be taken as required.

Stakeholder Participation and Risk Communication:

Risk communication is identified as a separate component in some, but not all evolving international risk models. In the present framework risk communication is achieved through stakeholder participation through-out the process. Managers are responsible for ensuring that appropriate stakeholder participation is made possible. However, all stakeholders are responsible for participating in risk communication. Risk communication includes elements of: a) information acquisition from stakeholders, including risk perception and prioritisation from stakeholders points of view; and b) information distribution to stakeholders describing how risks were assessed and plans for how risks will be controlled and monitored.

Risk Management Summary & Conclusions:

Ontario citizens benefit from Ministry employees' application of the principles of risk management including: hazard identification, risk assessment, risk control, stakeholder participation, continuous monitoring, learning and improvement.

Within the context of Ministry activities, the principles of risk management may be applied to: a) the design of new programs for the control of risks through guidelines, best practices, standards, regulations or inspection, investigation and enforcement activities, and b) the management of established programs to ensure effective and efficient use of public funds.

The detail appropriate for specific risk assessment and control documentation may range from a one-page list of headings, to multi-page reports, to lengthy detailed quantitative assessments, including mathematical modelling.

The task of risk management should <u>not</u> be limited to a few specialists. The power of risk management will increase if many employees use its basic principles on a daily basis.

Figure 3.1

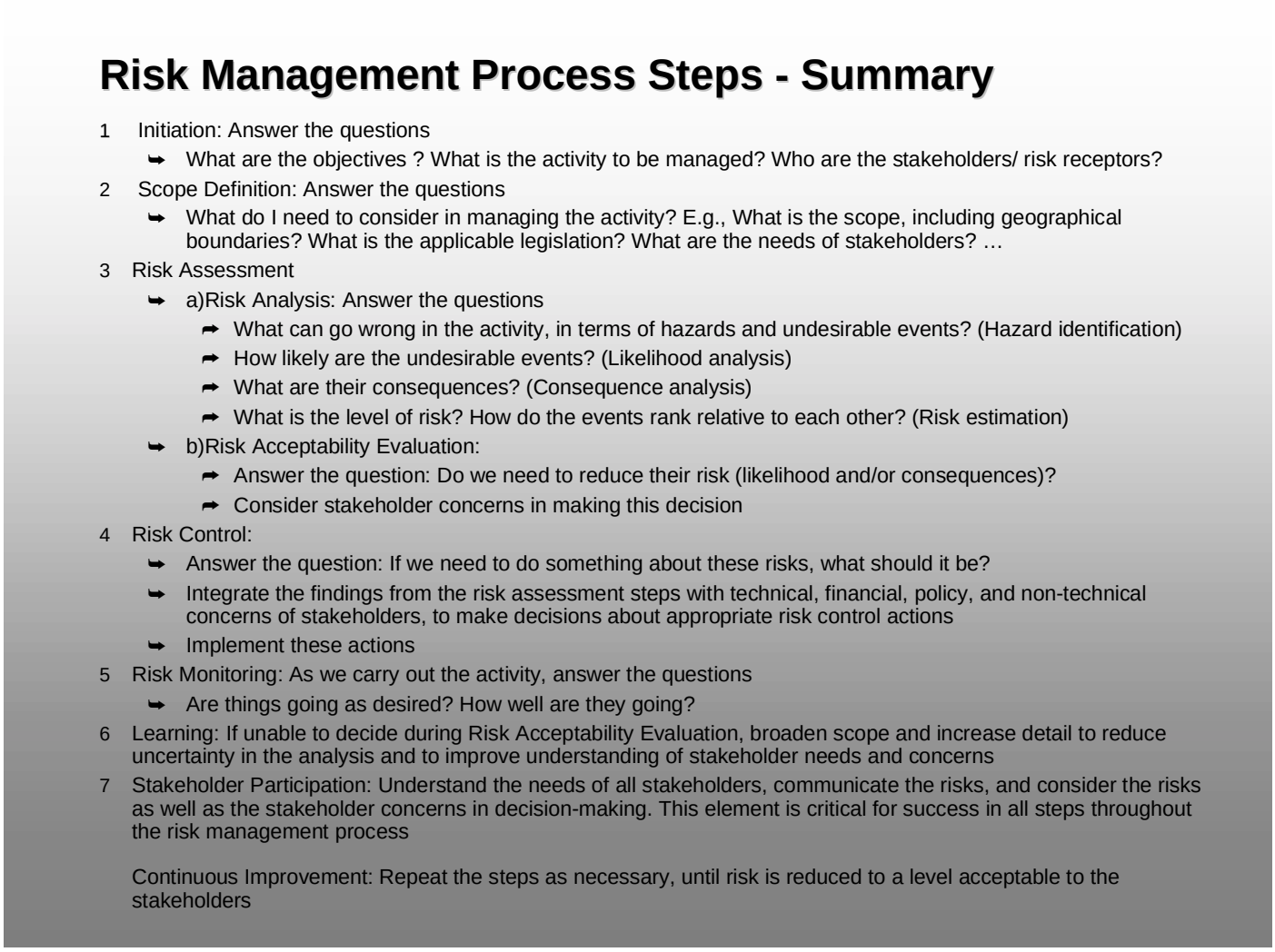
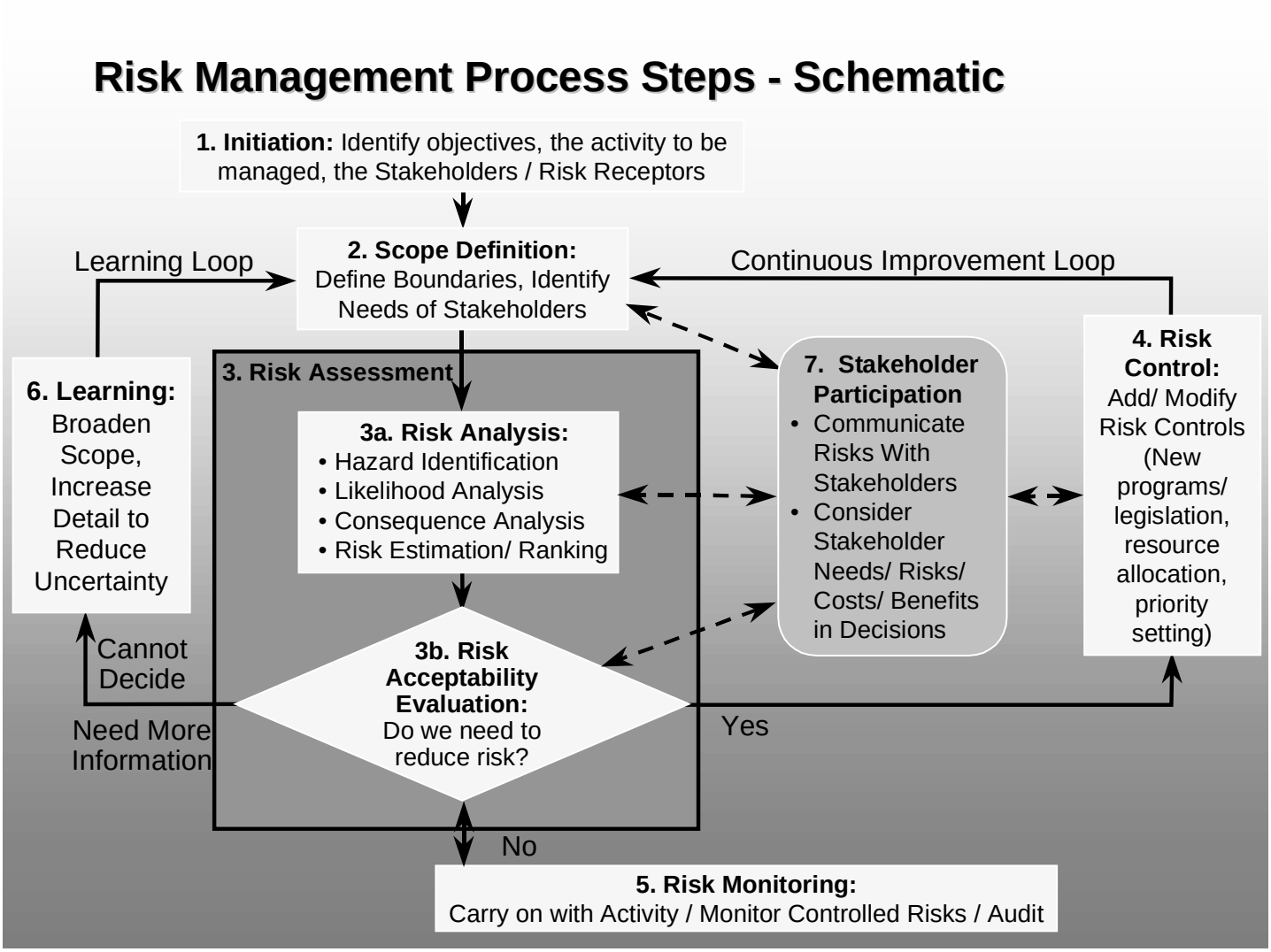

Risk Management Process Steps - Summary
1 Initiation: Answer the questions
What are the objectives ? What is the activity to be managed? Who are the stakeholders/ risk receptors?
2 Scope Definition: Answer the questions
What do I need to consider in managing the activity? E.g., What is the scope, including geographical boundaries? What is the applicable legislation? What are the needs of stakeholders? …
3 Risk Assessment
a)Risk Analysis: Answer the questions
What can go wrong in the activity, in terms of hazards and undesirable events? (Hazard identification)
How likely are the undesirable events? (Likelihood analysis)
What are their consequences? (Consequence analysis)
What is the level of risk? How do the events rank relative to each other? (Risk estimation)
b)Risk Acceptability Evaluation:
Answer the question: Do we need to reduce their risk (likelihood and/or consequences)?
Consider stakeholder concerns in making this decision
4 Risk Control:
Answer the question: If we need to do something about these risks, what should it be?
Integrate the findings from the risk assessment steps with technical, financial, policy, and non-technical concerns of stakeholders, to make decisions about appropriate risk control actions
Implement these actions
5 Risk Monitoring: As we carry out the activity, answer the questions
Are things going as desired? How well are they going?
6 Learning: If unable to decide during Risk Acceptability Evaluation, broaden scope and increase detail to reduce uncertainty in the analysis and to improve understanding of stakeholder needs and concerns
7 Stakeholder Participation: Understand the needs of all stakeholders, communicate the risks, and consider the risks as well as the stakeholder concerns in decision-making. This element is critical for success in all steps throughout the risk management process
Continuous Improvement: Repeat the steps as necessary, until risk is reduced to a level acceptable to the stakeholders

Figure 3.2


Risk Management Process Steps - Schematic
1. Initiation: Identify objectives, the activity to be managed, the Stakeholders / Risk Receptors
2. Scope Definition: Define Boundaries, Identify Needs of Stakeholders
Learning Loop
Continuous Improvement Loop
3. Risk Assessment
3a. Risk Analysis:
• Hazard Identification
• Likelihood Analysis
• Consequence Analysis
• Risk Estimation/ Ranking
3b. Risk Acceptability Evaluation: Do we need to reduce risk?
6. Learning: Broaden Scope, Increase Detail to Reduce Uncertainty
Cannot Decide
Need More Information
7. Stakeholder Participation
• Communicate Risks With Stakeholders
• Consider Stakeholder Needs/ Risks/ Costs/ Benefits in Decisions
4. Risk Control: Add/ Modify Risk Controls (New programs/ legislation, resource allocation, priority setting)
Yes
No
5. Risk Monitoring: Carry on with Activity / Monitor Controlled Risks / Audit

4) Making Decisions & Decision Analysis

Making Decisions:

We all make decisions on a daily basis. Should I have soup or salad ? Do I attend this meeting, that meeting, or stay in my office to beat back the growing list of unopened e-mails ? Should I buy this house, that house or continue to rent ? Should we focus our inspection on this type of establishment, that type of establishment, or should we inspect all establishments ? Should we implement this program, that program, or no program ?

In all these decisions we consciously or sub-consciously weigh the costs of each option, the potential benefits of each option and the likelihood of achieving the respective benefits. Said differently, given equal benefits and equal probabilities of success, we would choose the path of lower cost; or given equal costs and equal benefits we would choose the path with the greatest likelihood of success; or we may be willing to pay higher costs and face a lower probability of success, if the potential benefits are sufficient to justify the risk. This systematic consideration of: 1) costs (including the cost of failure), 2) probability, and 3) the benefits of success; is the essence of decision analysis.

Decision Analysis:

Formal decision analysis is a systematic process of documenting and weighing alternative scenarios in terms of their respective costs, probabilities of success or failure, and benefits.

Decision analysis is merely a tool to be used by people to make decisions. It is not a magic box in which some “expert” pushes a few keys on a computer to come up with the "right" answer. Decision analysis requires quality input information. Qualified people with experience in the area in which the decision is being made should be consulted for input and data. Those people should understand and feel comfortable with the tool of decision analysis.

"Paper and pencil" are the most important tools of decision analysis. They are used to systematically map out available options and their potential outcomes (ie. the "scenario tree" or "decision tree"). Then, the costs, probabilities and benefits of each scenario are estimated in absolute or relative terms. This systematic, visible approach helps to focus the decision maker (or decision team). It makes visible the information needs and clearly documents the elements that have been considered along each scenario. In many cases, completion of this process on a subjective level will clearly identify the appropriate decision path. In other cases, quantitative assessment is required to identify the best path from a mathematical perspective.

Computer software programs exist that solve the mathematics of decision analysis. They can take time to set up, but in qualified hands they can be very useful. They must have quality input. They

should be used only after the decision team has reached a consensus on the structure of the decision tree and the relative values or range of values being assigned to the costs, probabilities and benefits. The main advantage of such programs is that once set up, they facilitate sensitivity and threshold analysis. That is, given the same decision tree structure, they allow the analyst to alter the costs, probabilities and benefits, to see what happens to the decision under the new values. This will demonstrate how sensitive (or how robust) the decision is to the assumptions in the model. In threshold analysis, it allows the team to ask (for example): Given all costs and benefits remaining the same, at what "threshold" probability of success is it appropriate to change our decision?

Linkages With Other Types of Analyses:

Decision analysis involves a systematic consideration of the triad of costs, probabilities and benefits, of each scenario.

Benefit / cost analysis (or cost / benefit analysis) considers two of these three components for one scenario, to provide a benefit/cost ratio (or return on investment) for that scenario. Therefore, decision analysis can be viewed as a series of basic benefit / cost analyses, which also take into account the probabilities within each scenario.

Risk assessment considers the probability of something going wrong and the impact (or cost) of that negative outcome. So, risk assessment also considers two of the three components of decision analysis. Therefore, decision analysis can be viewed as a series of basic risk assessments, which also take into account the benefits of each potential outcome.

When and How Decision Analysis Might Be Used:

One might categorise decision analysis into three levels of complexity. Level #1 might involve a conscious or subconscious weighting of the three elements, in making every day, minute to minute decisions. Level #2 might be applied to more important decisions, that warrant a meeting among qualified people, to work through a schematic mapping out of the "decision tree" and a subjective weighting of costs, probabilities and benefits. For level #3, a more detailed and formal decision analysis process, complete with deterministic and stochastic mathematical models, might be reserved for decisions concerning complex systems that have implications involving hundreds of thousands or millions of dollars, in costs and benefits.

Information Needs and Added Complexity:

Formal decision analysis requires a systematic mapping of available alternatives and outcomes, with definitions of the expected costs, probabilities and benefits. This requires consultation with appropriately qualified personnel, which may involve crossing Ministry, academic or industry ‘silo’ boundaries. Such detailed information acquisition represents a considerable investment in itself.

Be aware that decision analysis can work well when the same individual or organisation: 1) bears the costs, 2) can influence the probability of the outcome, and 3) reaps the benefits of success. However, decision making becomes far more complex when different groups influence different components of the decision. For example, in making a decision concerning the use of his land, an individual farmer may consider the cost of seed and fertiliser, the probability of different crop yields, and the price he may receive for his harvest. But consider how much more difficult it might be to make a decision if: 1) he had to buy the seed and fertiliser, 2) he had to depend on his neighbour for proper application of fertiliser, and 3) his brother-in-law got paid for the crop ! At first glance this scenario may seem ridiculous. However, it is not unlike situations that routinely face regulatory agencies, where: 1) one group expects to reap the benefits of a successful outcome, but 2) another group may bear the cost of failure if things go wrong, and 3) the regulatory agency may be responsible for designing and implementing regulatory programs that reduce the probability of the negative outcomes.

Nevertheless in complex situations, this systematic approach to the decision process can be used to keep decision makers on track and to explain, document and justify the decision to stakeholders. The alternative is to risk making less rational, less defensible, less efficient decisions.

Quality of Information and Test Performance:

The quality of a decision is only as good as the quality of the information used to make that decision; "garbage in, garbage out". One might ask: Have we identified all the important factors ? Do we have relevant measures of costs, probabilities and benefits ? Are those measurers accurate and precise ? Do we understand the variability of these components ? How certain are we of the data?

In making regulatory and program decisions, many employees use information derived from some sort of tests or surveys. Employees may be called upon to interpret test results, to make decisions about specific situations or to change programs (e.g. recommend a treatment, accept or reject a specific lot, change the frequency of testing or the type of tests used in a program). An understanding of the performance capabilities of the tests and surveys used, is required to make such decisions (e.g. test sensitivity, specificity, predictive values, and survey representativeness and precision). For a more detailed discussion see OMAFRA document entitled "Basic Principles of Evaluating Test Performance for Making Decisions".

Decision Analysis Summary & Conclusions:

OMAFRA program designers, managers, analysts and front-line employees can benefit from understanding and applying the basic principles of decision analysis. Managers can use decision analysis in a system of risk based resource management. There should be gains in efficiency within the Ministry if employees share a common basic methodology when contributing information to, and when making decisions.

Appendix A

Glossary of Terms As Used In OPS, II&E and OMAFRA Risk Management Frameworks

Including: For illustrative purposes, selected cross referenced definitions used by the Codex Alimetarius Commission of the FAO & WHO for food safety risk assessment.

Acceptable (tolerable) risk:	A level of risk that stakeholders are willing to accept or tolerate. Generally, whether the risk from an undesirable event is acceptable or not is established by ranking that event relative to others.
Consequence Codex hazard characterization:	The potential impact of an undesirable event on a risk receptor. It should be measurable in commonly understood terms, such as health impact (e.g., fatality, injury, illness of people), environmental impact (e.g., loss of resource use, species endangered), and/or financial cost (e.g., asset damage, lost productivity, unproductively utilized person-years, missed program deadlines) This is analogous to the concept described in Codex terminology as hazard characterization.
Hazard:	A condition (e.g., physical, political, social) that has the potential of causing damage or any kind of harm to the risk receptors. More precisely, hazards are conditions that are inherent in the activity that is being analyzed, and which, if something does not go as planned, or deviates from intended norm ("undesirable event" or "deviation"), can lead to adverse impacts on the well-being of one or more of the risk receptors. (In a food safety context, Codex defines a food hazard as a biological, chemical or physical agent in, or condition of, food with the potential to cause adverse health effect)
Likelihood:	A measure of how often a given undesirable event might occur (its frequency or probability).

Risk:	A measure of adverse impact due to a hazard, taking into account both the likelihood and magnitude of damage. (Codex defines risk as a function of the probability of an adverse health effect and the severity of that effect consequential to a hazard(s) in food).
Risk acceptability evaluation:	Making a decision about the acceptability of risk from an undesirable event, or about the total risk from an activity that could result in many different undesirable events. This may involve comparing the level of risk against pre-determined standards, or comparing against risk from other undesirable events for ranking and prioritization purposes.
Risk analysis analogous to Codex risk assessment :	The process of identifying the hazards of an activity and potential undesirable events, analyzing the consequences and likelihood of these undesirable events, and estimating their risk, sometimes by ranking them relative to each other. (Codex defines risk analysis as a broader process consisting of three components: risk assessment, risk management and risk communication. Codex use of the term risk analysis is analogous to broad use of the term risk management in this OPS II&E risk terminology)
Risk assessment:	The process of analyzing risk and evaluating its acceptability (i.e. the combination of risk analysis and risk acceptability evaluation steps as described above). (Codex defines risk assessment as a scientifically based process consisting of the following steps: I) hazard identification, ii) hazard characterization, iii) exposure assessment, and iv) risk characterization)
Risk control Codex risk management:	The process of integrating findings from the risk assessment with technical, financial, policy, and non-technical concerns of stakeholders, to develop and select suitable risk control actions, and implementation of these actions. Risk control actions include implementation of policies, standards, procedures and physical changes. (Codex refers to this concept as risk management)

Risk management Codex risk analysis:	The overall process of identifying potential hazards and undesirable events, understanding their consequences and likelihood, and taking steps to reduce their risk if necessary. A significant component of risk management is identifying stakeholders and their needs, and balancing them in the decision making process. (Codex refers to this overall process as risk analysis (see above) and uses the term risk management more in the sense that this document uses the term risk control. Codex defines risk management as a process, distinct from risk assessment, of weighing policy alternatives, in consultation with interested parties, considering risk assessment and other factors relevant for health protection of consumers and for the promotion of fair trade practices, and if needed selecting appropriate prevention and control options).
Risk receptor:	Entity or individual that can be impacted adversely as a result of an activity undertaken by that entity or individual, or by others. Examples include members of the public, businesses and their employees, the OPS and its employees, and the environment.
Stakeholder:	Entity or individual that has an interest in an activity. Stakeholders are generally also risk receptors and include individuals, groups or organizations who may affect, be affected by, or perceive themselves to be affected by, a decision or activity.
Stakeholder participation Codex risk communication	Identifying the stakeholders/ risk receptors, understanding their needs and concerns, and taking into account these needs, concerns and other inputs in making decisions. Stakeholder participation is paramount in successful risk management. Codex refers to this concept as risk communication which it defines as the interactive exchange of information and opinions throughout the (Codex) risk analysis process concerning risk, risk related factors and risk perception among risk assessors, risk managers (controllers), consumers, industry, the academic community and other interested parties, including the explanation of risk assessment findings and the basis of risk management (control) decisions.

Undesirable event: An event that brings out the hazard and results in an adverse consequence for the risk receptor.